...IONS FROM THE YOUTH'S COMPANION

ARRANGED FOR

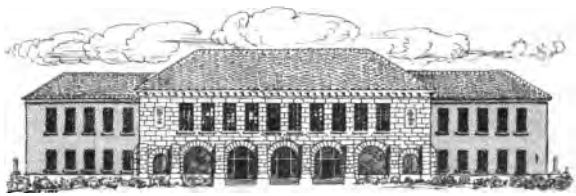
Supplementary Reading In Schools.

No. 5.

Old Ocean.

PERRY MASON & COMPANY,
Boston, Mass.

PRICE 10 CENTS.



SELECTIONS

The Youth's Companion

SUPPLEMENTARY READING.

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OLD OCEAN.

CONTENTS.

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Under the Shadow of the Berg.

About Icebergs.

The birthplace of icebergs is on the coasts of Greenland. This great land-mass stretches away twelve hundred miles toward the Pole. It might be named a continent, since it has an estimated area of five hundred and twelve thousand square miles, and thirty-four hundred miles of coast line.

The whole interior of Greenland is covered by an immense ice-cap, many hundred feet in thickness. The sun's rays, falling on the snow at the summits of the mountains, partially melt it into a granular mass. The valleys receive the drainage from these granular snow-fields, and the cold converts it into a solid mass of ice — a glacier.

The great weight of snow acts as a propelling power from behind, and forces the icy stream constantly onward toward the coast, which it lines with an enormous crystal precipice.

At last the front of the glacier is forced by the propelling power behind it into the sea, and into deeper and still deeper water. It begins to feel the action of the waves and tides which wear away its base; and great cliffs of ice overhang the ocean.

Now let us witness the birth of an iceberg. A lofty cliff of ice, thus overhanging the water, has been for some time showing signs of insecurity. Great caverns have been excavated in its base; deep fissures are discernible in its face. Suddenly, with a roar far louder than thunder, the ice-mountain snaps asunder, and the detached mass comes grinding, crashing down.

A cloud of spray dashes high into the air, and the young iceberg is born.

It dives as it touches the waves, rises slowly, sways and tumbles to and fro, but at last secures its balance. Its front is one hundred and fifty feet above the waves, but there is eight times as much bulk beneath as above the surface; so

The Birth of an Iceberg.

that its weight may be millions of tons. The berg is scarcely launched into life before it begins to feel the influence of the great Arctic current that is rushing southward through Baffin's Bay and Davis Strait. Borne on the bosom of this stream, it starts on its long voyage of six or possibly twelve months.

At last our berg reaches southern latitudes and a warmer clime. What the fury of tempests and the blows of the billows could not accomplish, the silent rays of the sun and the action of the warmer air begin slowly to effect.

The iceberg becomes relaxed in the joints. Streamlets are trickling down its sides. Its constitution is shaken. Great crags ever and anon fall from it, with a sullen plunge into the ocean.

Now it becomes top-heavy, reels and turns over. Woe to the vessel that is near when this takes place! Rocky fragments embedded in its now upturned base are exposed to the light. The berg presents a completely new front and summit, which have been sculptured by the waves, and is no longer recognizable as the same towering monster that left the portals of the north months before.

It is now in a state of unstable equilibrium, and frequently turns over with a hoarse roar. All sailors know the dangers of icebergs in this condition. They call them "growlers," and give them a wide berth.

Shorn of its glories, and greatly reduced in size, the berg still holds on its course and approaches the Banks of Newfoundland. Now it enters the warm water of the Gulf Stream, and its dissolution is at hand. Cascades are streaming down its sides. Caverns are worn right through its centre. Small lakes are formed on its summit. Rents and fissures are constantly widening.

Finally it bursts, with an explosion like thunder. Its shattered remains are scattered far and wide, and speedily melt in the warm waters. The berg is no more.

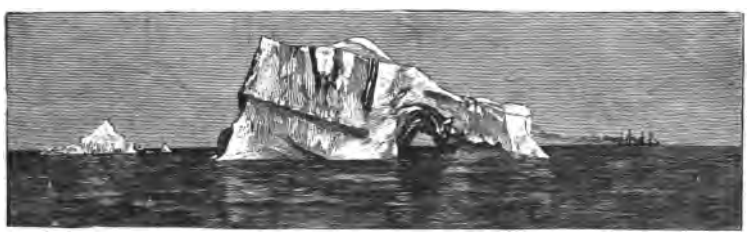
Such is the life-history of an iceberg. When it reaches a certain stage, and its cohesive powers are relaxed,—when it becomes "rotten," as the sailors say,—it is especially

dangerous. Then a slight cause will make it explode, and it bursts into ten thousand fragments, raising huge billows which might swamp a vessel.

The concussion of the air from the firing of a gun, or even the noise made by a steamer, has been known to cause such an explosion.

Sometimes a berg has projections, or spurs, underneath the water, stretching far out from its base. A vessel that ventures too near may strike on one of these unseen ice-reefs.

Such an event happened in July, 1890. A steamer with tourists on board, who were anxious to have a near view of a large berg, approached so close that she struck on one of its



An Iceberg at Sea.

jutting spurs. The shock and the weight of the heavily-laden vessel broke off the spur, and at the same time a huge cliff of the berg, many hundreds of tons in weight, fell into the water with a fearful roar, behind the steamer.

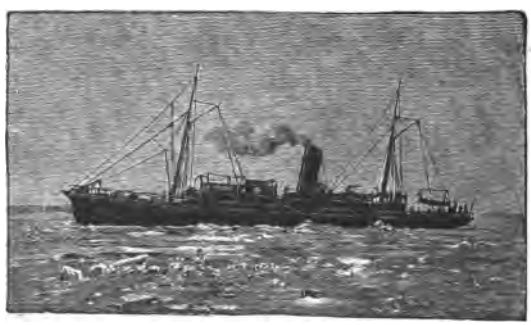
A great wave lifted her stern, and with a violent plunge she seemed to be going down to the bottom. It was a trying moment for those on board, but the good ship slowly came up, her deck covered with ice-fragments, and cataracts of water streaming from her on all sides. After a few convulsive tossings on the disturbed waters she righted, and managed to get out of that dangerous neighborhood. It was an extremely narrow escape.

There are many berg-producing glaciers on the Greenland coast. The largest known,—the Humboldt,—was reported

by Doctor Kane as extending forty miles along the coast, and presenting a perpendicular front three hundred feet high. The glacier, which has been measured most carefully, is eighteen hundred feet wide and nine hundred feet thick, and it advances at a rate of forty-seven feet a day.

Sir John Ross once saw a berg two and one-fifth miles broad, two and one-half miles long, and one hundred and fifty-three feet high. He calculated that the entire mass weighed fifteen hundred million tons. In the Southern Hemisphere much larger bergs have been seen, towering seven hundred to eight hundred feet above the waves. It must not be forgotten that in estimating the size of an iceberg the visible portion is only one-ninth part of the real bulk of the whole mass. Off the Newfoundland coast it is quite common to meet bergs one hundred feet high; so that the lowest peak of one of these may be eight hundred feet below the waves.

M. HARVEY.



An Ice Jam.

The Gulf Stream.

The Gulf Stream.

What is the Gulf Stream? Whence does it come? Where does it cease to flow? To what cause is it due? These questions have been asked from the time when Columbus made his great voyage of discovery four hundred years ago, down to the present day, and even now some of them have not been satisfactorily answered.

Lieutenant Maury began his description of this wonderful phenomenon with the expression, "There is a river in the ocean." The phrase explains in few words exactly what the Gulf Stream is. It flows along the coast of North America from the lower extremity of Florida to Cape Hatteras, and thence crosses the Atlantic toward the shores of Europe. Like land rivers, it has its source, the Gulf of Mexico, which is fed from the Caribbean Sea. This in turn receives its water from the eastern Atlantic Ocean, into which the Gulf Stream itself pours its own supply, so that there is, in reality, a grand circular movement of the whole ocean, of which the Gulf Stream is a portion.

Our ocean river does not run dry, like those on land, nor does it do much harm when, like the Mississippi, it overflows its banks, because its banks are water, and can easily be pressed aside. It always flows in about the same place over the bottom, too, and when it does change its position it is only in accordance with a law, which makes it return to its original position after a regular time as certain as that spring follows winter. It does not always flow on the surface of the sea, for occasionally it dashes along below the waves; but the same law guides it, and after awhile it is sure to rise again to the light of day.

This river is very warm, because it comes from the Gulf of Mexico and the Caribbean Sea, where the sun has been heating it for a long time. Of course, after it has left its

southern home, and is making its journey across the Atlantic, it is gradually becoming cooler; but, nevertheless, it maintains to the shores of Europe, even well up toward the Arctic regions, a much higher temperature than that of the surrounding air or water.

It has its own finny inhabitants and other animal life; curious little fish and crabs that make nests in the floating sea-weed; beautiful little jelly-fish called thimble-fish, floating

Beneath the Surface.

or swimming near its surface in such countless numbers that at times the waters are brown with them; and the graceful flying-fish, which dart out of the water in schools; and countless myriads of minute animal life floating about, so that, when the sun is shining high in the heavens, the water seems

to be filled with motes. These little things, dying, sink to the bottom, and their diminutive skeletons or shells go to form an ooze, which if exposed to the air and to pressure, resembles chalk.

This ocean river is quite unlike the rivers of the land in point of size. The Mississippi, at a point below its lowest tributary, is about two thousand feet wide and one hundred feet deep. At places it is wider than this, but there it is shallower. The Gulf Stream, at its narrowest point in the Strait of Florida, is more than two thousand feet deep, and over forty miles wide.

In point of speed, but few navigable rivers in the world equal the Gulf Stream. It hurries along three, four, five, and sometimes over six miles an hour. Even three miles is fast enough to delay or assist in a great degree, in the course of twenty-four hours, any vessel which happens to be in its influence.

The water is a beautiful deep blue, and so clear that one may look far into its depths. On the edge nearest the coast, where it presses against the colder shore water, its line of meeting with the shore water is frequently so sharply defined that at one end of the vessel you may have the clear warm water from the south, while at the other end is the cold murky water from the north.

Nature is always wonderful, and one can hardly fail to be impressed by the grandeur of high mountains, lofty precipices, immense forests, glaciers and waterfalls, but the Gulf Stream is the greatest of all of nature's wonders on this earth. It is impossible to realize the immensity of it, because it does not appeal to the eye, and the mind can hardly grasp its magnitude by the aid of an array of figures.

We all know that the sea water is salt. Contained in every thousand pounds of water there are thirty-five pounds of saline matter. Now if you could stand on the shore of Florida, and could take all of this saline matter out of the water of the Gulf Stream as it flowed past, during only one minute of time, all the vessels in the world at the present time would

not be enough to carry the load. When Columbus crossed the ocean to America for the first time in 1492, he discovered the existence of the current which enters the Caribbean Sea, and helps to form our Gulf Stream. All the old Spanish navigators noticed this current, and wondered what could be its cause.

Columbus gave a reason which was generally accepted as correct for many years. He saw that the heavenly bodies appeared to rise in the east, and go down in the west; that the winds in the tropics always blow from the east, and the currents of the ocean move in the same direction. So he concluded that the fluid and gaseous elements on the earth's surface, the air and the water, simply partook of the motion of the sky, and all went around the earth together.

The Gulf Stream itself was not discovered until the famous Ponce de Leon went to search for the Fountain of Youth. The natives told of a wonderful well or spring on the Island of Bimini, and the Spaniards, who were always on the lookout for remarkable or valuable objects, fitted out this expedition of discovery.

They did not know where Bimini was, except that it was somewhere northwest of Porto Rico; but they set out, hoping to find the means of cheating time, and making the old young again. They sailed along the eastern side of the Bahama Islands, and finally reached the coast of Florida. Then they turned south, and sailed against the current for several hundred miles, all the time wondering where the water came from without exhausting the supply, and where it went to without filling up some other place.

After several years it was concluded by many persons that all the water of the sea was moving; that it reached a hole in the earth and went down, and at some other point, a great distance away, returned again to the surface at the starting-point of that or some other current.

In quite recent years the government has started out to ascertain the laws of this river. A steamer is anchored in the ocean, and from it the speed and direction of the water, as it

flows past, is measured directly, not only on the surface, but hundreds of feet below. Steamers have already anchored in water nearly two miles and a half deep, and probably there is no spot in the ocean at which we shall not be able, before long, to observe the currents.

Instead of employing a chain, as vessels ordinarily do when anchoring in harbors, these steamers use a long, steel wire rope, which is lowered, pulled in, and wound up on a large iron spool, by steam-engines.

In this way we have learned that this great river is governed by laws such as those which govern the tides. You will remember that the tides rise and fall generally twice each day, the greatest rise and fall during the month coming about the time of the new and full moon.

In the same way the Gulf Stream's current varies in strength every day, and at different times in the month, depending upon the position of the moon in the heavens. It varies in temperature according to the season, and in position, too, a little; but the grand stream is not erratic. All its movements are fixed by laws that do not change.

It is maintained by some, that the current moved so far to the northward a few years ago that it bathed the shores of Nantucket and Long Island, causing the weather in New England to be warmer than usual. This conclusion was based upon the fact that sea-captains found the warm water farther north than usual, and on the finding of a floating sea-weed, peculiar to warm waters, much nearer the shore than customary. But as we have seen, the temperature is a poor guide as to the limits of the current; and the same wind and waves that can carry the water can also carry the small fragments of floating weed.

Then, too, if the current did reach the shores, it could hardly temper the climate far inland unless the wind carried the heated air; and this the wind can do about as well from the regular position of the current as from any position to which it may have moved.

The month of December, 1889, was very warm for the

season of the year, and the cause was assigned by many to the erratic movement of the Gulf Stream. East of the Rocky Mountains the United States Signal Service had eighty-six signal stations, and at sixty-five of these stations, many of them over a thousand miles from the sea, the temperature for the month was many degrees above normal.

At Cape Hatteras the stream is always, winter and summer, very near,— indeed, it is just outside the shoals,— and yet here the temperature was more than six degrees warmer than the normal.

For the cause of this we must look to the air, and not the water. As it happened during December, the air pressure as shown by the barometer was higher than usual in the vicinity of the Gulf of Mexico and the Southern States, and much lower toward Canada, so that the general movement of air was from the warmer toward the colder parts of the continent. The Gulf of Mexico and the Gulf Stream are warm, and the heated air, rising from them, was carried north, and so tempered the weather for the month.

Now what is the cause of the Gulf Stream? Some say that the water in the tropics, being heated, and consequently lighter than the cold, heavy polar water, flows northward on the surface, and the other water southward, underneath. Others say that the Trade Winds, always blowing in one direction toward the west, blow the water along, too, and so begin and afterward keep up the movement. Both are, perhaps, right to a certain extent, as to currents in general, but the Gulf Stream is probably almost wholly due to the wind and the waves alone. The water is pushed by the wind, and thrown by the waves into the Caribbean Sea, from the western end of which the accumulation of water runs into the Gulf of Mexico, and from there it escapes through the Strait of Florida into the Atlantic Ocean.

J. E. PILLSBURY.

The Kuro Siwo.

Those of our readers who study geography, and especially physical geography, will hardly have failed to notice the remarkable difference between the climate of the eastern, or Atlantic coast of North America and that of the western, or Pacific coast in the same latitude.

Take, for example, the shores of Newfoundland, Labrador and Greenland, as compared with those of Vancouver's Island, Queen Charlotte Islands and Alaska. On the Atlantic coast are found icebergs, icefields, frozen bays, stunted shrubs, and only the most hardy of plants and grasses, while on the Pacific coast are noble forests, luxuriant grasses, and a generally equable climate throughout the year.

Juneau and Sitka in Alaska are but three degrees farther south than Cape Farewell, the southern point of Greenland, and they are ten degrees farther north than the southern part of Newfoundland. But at Juneau herd's-grass may be seen growing seven feet in height, and the flourishing kitchen gardens are untouched by frost till late in September.

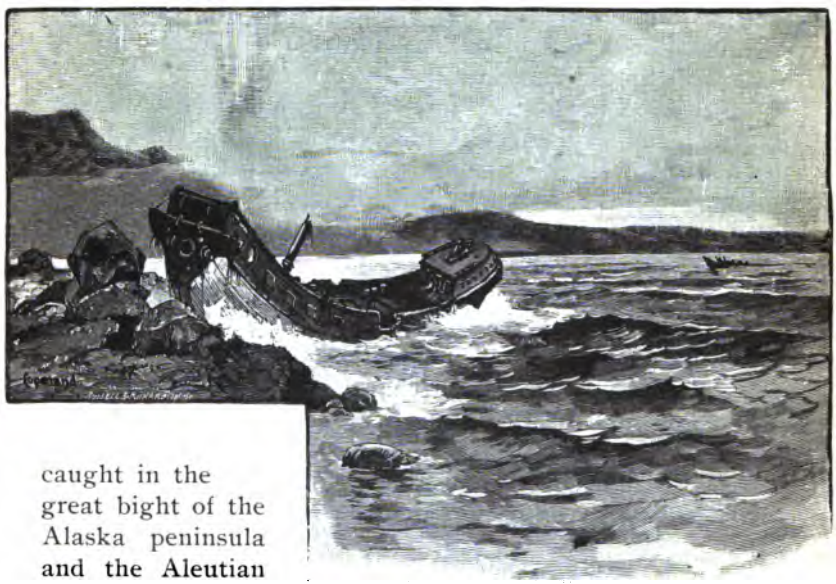
About Sitka are grand old woods, where firs and hemlocks grow to a great size. The cedars of the Queen Charlotte Islands also attain an enormous size, larger even than the famous cedars of scripturally classic Lebanon. From these great cedar trunks the Haida Indians excavate immense canoes, often sixty feet in length by six or eight in breadth,—which are capable of carrying a party of forty or fifty warriors.

We are so accustomed to regard climate as regulated by the distance from the equator, that these facts seem strange, and we are led to inquire the cause. Why does the west coast have so much the milder and better climate? The answer is in two words:

"Kuro Siwo."

These two words are from the Japanese language and

signify "Black Stream." The Kuro Siwo — so called from the tint of the water within its limits — is a northeasterly deflection of the great ocean current which flows north from the equatorial seas and renders the climate of the Japan Islands so equable and fruitful. A part of this warm stream in the ocean crosses the Pacific from the coasts of Asia, and,



Drifted by the Kuro Siwo.

caught in the great bight of the Alaska peninsula and the Aleutian islets, flows in and out among all those hundreds of islands, from Sitka southward to Vancouver, and gives to this whole coast its moist, mild winter.

But not alone has the Kuro Siwo brought warmth and moisture to the northwest coast; it is now credited, by some scientific men, with having borne the first human inhabitants to America.

Eighty-five years ago, while the Russians were still in possession of Alaska,— or Russian America, as it was then called,— the attention of the good people of Sitka was attracted

one morning to a strange-looking craft, which had apparently come ashore during the night on one of the hundred little, rocky, wooded islands that lie about the harbor — the islet which to-day bears the name of Japonskoi.

Boats were manned, and those who approached the stranger found it to be the dismasted, half water-logged and unmanageable hull of a Japanese junk. Strange to say, there were ten or twelve Japanese on board, nearly dead from exposure, disease and famine.

The junk had been dismasted in a tempest, while on a voyage from one Japanese port to another, and, beyond the power of the hapless crew to prevent it, had drifted steadily northeastward in the Kuro Siwo, which sets constantly and quite strongly from the coasts of China and Japan across the Pacific toward America.

Thus we have it demonstrated that even within the present century the Kuro Siwo has borne human beings from Asia, the "great mother of the human race," to America. There are also traditions that, on two former occasions, Japanese or Chinese junks have drifted to the coast of America farther southward. How many times these significant accidents may have occurred in the great unwritten past of our continent no one knows, and who shall attempt to say?

Many ethnologists believe that the aboriginal Indian tribes of America are of the same race and origin as the early people of Siberia and Japan. Did the Kuro Siwo bring them?

There have been many theories as to how America was first peopled: one, that the earliest inhabitants came hither from the mythic sunken continent of Atlantis; another, that they were the far-wandering "lost tribes" of Israel, and still another that they crossed Bering's Straits on the ice from Asia.

This last theory, suggested by the Japanese junk borne to Sitka by the Kuro Siwo, may bear examination, but, like other speculations of the class, it is incapable of proof — and not of other than strictly scientific value, even if it could be proved true.

The Trade Winds.

Most people have heard or read of the Trade Winds — or simply "The Trades," as they are called by sailors — but probably it is not generally known what causes these winds and where they are found.

It is easy to understand that a wind which is steady in force and constant in direction is of great benefit to sailing vessels, and it is from this advantage to navigators — and hence to trade — that the Trade Winds take their name.

A Fair Wind.

These winds are permanent over both the land and water, prevailing in, and often beyond, the torrid zone. As the air within this zone receives a greater amount of heat than the air outside, it rises, and its place is supplied by the colder air which rushes in from beyond the tropics.

If the earth were at rest, it is evident that a north wind would blow in the northern half of the torrid zone, and a south wind in the southern half. But the earth, instead of being at rest, revolves on its axis from west to east. A little reflection will enable any one to understand that the greatest velocity resulting from this rotation must be found at the Equator, and that as one recedes from the Equator, the velocity diminishes until the pole is reached, where it is nothing.

The wind which is rushing toward the Equator has continually a less velocity than that of the surface over which it

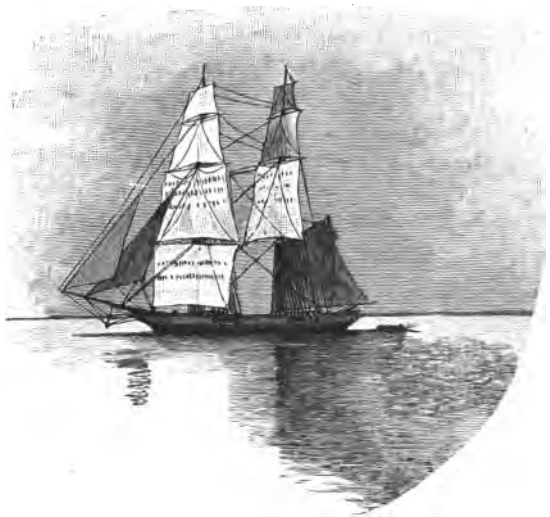
passes, and so falls behind more and more as the Equator is approached. This gives it a direction opposite to the earth's rotation, in other words, a direction from the east to the west, which, combined with the motion from the north and south, before mentioned, gives as a result the northeast Trades in the Northern Hemisphere, and the southeast Trades in the Southern Hemisphere.

Speaking roughly, the limits of the Trades are thirty degrees north latitude and thirty degrees south latitude, between the two being a band of calms and light, variable airs. This belt is called "The Doldrums," perhaps from the old Spanish word "dolorosa,"—signifying tormenting, which a region of calms and variables undoubtedly is to a sailing vessel. The Doldrums are the meeting ground of the northeast and the southeast Trades, and at this meeting point they have a neutralizing effect on each other. Here rains are heavy and frequent.

The limits of the Trades are constantly changing, varying with the season of the year. Following the motion of the sun in the heavens, in the summer they extend perhaps two or three hundred miles farther toward the north, and in winter they recede toward the south. It will be understood from this that the belt of Equatorial calms is variable in position as it also is in width. In spring its centre is found about one hundred miles north of the Equator, while in summer it extends five hundred miles higher in latitude. Its width is ordinarily three hundred miles, but sometimes it is thrice as wide, and then again there is occasionally no dividing line between the Trades, and vessels are fortunate enough to run directly from one into the other.

To come now from the Trades in general to the Trades of the Atlantic. These have been known for centuries. Columbus probably noted the northeast Trades on his first voyage of discovery. When not interrupted by hurricanes, which are uncommon, except in August, September and October, this northeast Trade Wind region is a veritable summer sea, so much so, indeed, that it was called "The Lady's Gulf" by

the old Spanish navigators. It extends from the Doldrums to the Horse Latitudes, which is a belt of calms and variable winds found between thirty degrees and thirty-five degrees north latitude, according to the season of the year, and takes its peculiar name from the fact that in early days, ships



Becalmed.

engaged in carrying cargoes of horses from Europe to the West Indies frequently found it necessary to throw them overboard, owing to the frequent changes — rains, thunder, lightning, puffs, and calms following each other in rapid succession in this perplexing region.

Both the northeast and southeast Trades of the Atlantic blow over a wider extent on the African than on the American side, but, on the other hand, the Doldrums are much broader on the eastern side, making it a part of the ocean to be avoided, if possible. The southeast Trades are much stronger and constant than the northeast, which are, in fact, somewhat capricious, frequently showing breaks in their regularity

which it is hard to account for. I have, after experiencing very fair southeast Trades, steamed entirely across the northeast Trade Wind region, in the month of May, without finding any wind at all to speak of.

It is hard to explain why, on a given day, a vessel in this region should find good, steady Trades, while on the

In a Gale.

same day, another vessel, a few miles east or west of the first, should encounter nothing but calms.

The Trade Wind regions are a delight to the mariner. Fogs are seldom experienced, and gales rarely occur. The weather is pleasant and the air dry. The wind being constant, the captain and officers have very little anxiety, and the sailors still less, of the usual and monotonous work of setting and taking in sail, reefing, and bracing yards. In fact, vessels sometimes "run down the Trades" under all sail, and for days together there is no necessity of touching a rope.

E. B. UNDERWOOD.

The Mariners' Compass.

"Do not speak to the man at the wheel" is printed on the wheelhouse of many sea-going steamers. Why must the man at the wheel not be spoken to?

Because, during his two hours' turn, his attention ought to be fixed upon his compass. Let him turn to a passenger to answer a question, and the vessel will depart slightly from her course. Time will be lost, force will be wasted, and the steersman will hear a short, sharp word from the officer of the deck, calling him back to his duty.

The compass is the very eye of the ship. A skilful seaman, using the knowledge which the compass has already given him, could navigate a vessel across the Atlantic — in time. It is the compass that enables the captain to shoot his arrowy steamer over the trackless sea in less than a week, through fog, darkness and storm, without swerving from his course.

Man possesses few instruments more valuable than this, and yet no one knows who invented it. If we ask the Chinese, the people who invented so many useful things, they point to some obscure passages in their ancient books, which do not prove their claim. If the Chinese had the compass, why did they not use it? From time immemorial their lumbering junks hugged the shore, and rarely ventured farther out to sea than to Japan, which is only a few miles from the coast of Asia.

If we ask the Greeks, we begin to get a little light on the subject, for the Greeks at least knew something of the attractive power of the magnet.

They tell us, in their mythological way, that a shepherd named Magnes, while pasturing his flock upon Mount Ida, found one day that the iron at the end of his staff adhered to the ground, and to the nails upon his shoes. He picked up some of the dark-colored stones under his feet, brought them

home with him, and thus gave to mankind a knowledge of the magnet, which was named after him. The Greeks were great story-tellers. They had their legends about everything, and this about Magnes is one of them, from which we can at least learn that they were acquainted with the magnet's power of attraction; but they knew nothing of that valuable quality which it imparts to the needle of the compass. They knew

A Chinese Junk.

no method of steering vessels in the open sea except by the stars, the flight of birds, and glimpses of the distant headlands.

Nor did the Romans. The Roman writers were lost in wonder at the magnet's attractive power, but there their knowledge of it ended. The elder Pliny speaks of it with the simple amusement of a little child.

"What is there in existence," he asks, "more inert than

a piece of rigid stone? And yet, behold! Nature has here endowed stone with both sense and hands. What is there more stubborn than hard iron? Nature has in this instance bestowed upon it both feet and intelligence. It allows itself, in fact, to be attracted by the magnet. . . . The moment the metal comes near it, it springs toward the magnet, and, as it clasps it, is held fast in the magnet's embraces."

This was written about the year seventy of our era, and there is no proof that any one in the world had yet detected the marvellous power of the magnet to impart to a piece of iron the propensity to point to the north. The passage in the New Testament which describes the eventful voyage and shipwreck of St. Paul speaks (Acts 28 : 13) of "fetching a compass," but the new version gives a better translation, "we made a circuit, and came to Rhegium." No Mediterranean pilot in the time of St. Paul steered his bark by the aid of the magnetic needle.

It was at some time near the end of the twelfth century of the Christian era that the mysterious power of the magnet upon the needle became known to a few of the learned men of Europe. Probably the knowledge of it was brought to them by the Crusaders returning from the Holy Land, and there is much reason to believe that this power of the magnet was first observed by the Arabs, an ingenious race, and the most skilful travellers in the Middle Ages, whether on land or sea. The Crusaders began to return home in numbers about A. D. 1100, and the knowledge of the magnetic needle gradually spread over the north of Europe. The bold Norwegians seem to have been the first to use the needle in navigating the sea.

In the year 1258, a learned Italian, named Brunetto Latini, who was afterwards tutor to the poet Dante, travelled in England, and visited at Oxford Friar Roger Bacon, a man devoted to the pursuit of science.

Latini wrote letters home to his friends, in one of which he says that Friar Bacon showed him, among other things, "a black, ugly stone called a magnet, which has the surprising property of drawing iron to it, and upon which, if a needle be

On the Bridge of an Ocean Steamship.

rubbed and afterwards fastened to a straw, so that it shall swim upon water, the needle will instantly turn toward the Pole Star; so that, be the night ever so dark, neither moon nor star visible, yet shall the mariner be able, by the help of this needle, to steer his vessel aright."

Here we have the fact plainly stated, as it had been known to a few persons in England and France for many years. Friar Bacon imparted this knowledge to the Italian traveller as a dreadful secret, perilous to disclose to the common people, and still more perilous to make known to the ordinary priests of the age. Latini explains the reason, and in truth, Roger Bacon passed ten years of his life a prisoner, partly because he knew a little too much of the secrets of nature, and partly because he advocated the reform of the church.

"This discovery," continues Latini, "which appears useful in so great a degree to all who travel by sea, must remain concealed until other times; because no master-mariner dares to use it, lest he should fall under the supposition of being a magician; nor would even the sailors venture themselves out to sea under his command, if he took with him an instrument which carries so great an appearance of being constructed under the influence of some infernal spirit."

These two learned men conversed upon this wondrous quality of the magnet, and they looked forward to some happier time, when men should be more enlightened, and not afraid to make researches in natural science. Then, said Latini, mankind will reap the benefit of the labors of such men as Friar Bacon, and bestow honor upon them "instead of obloquy and reproach."

Neither Bacon nor Latini lived to see that better time for which they hoped. When they had been dead a hundred and fifty years, the Portuguese, under Prince Henry, the Navigator, were using the compass in their voyages down the African coast. In a few years the Madeiras and the other Atlantic groups were discovered by its assistance.

The Cape of Good Hope was turned, and India reached by sea. One of the mariners formed in the school of Prince

Henry was a man destined to put the compass to the sublime use of discovering a new world.

Seamen did not long employ so awkward an instrument as a needle floating in a straw on a basin of water. About the year 1300 an Italian navigator, named Flavio Gioja, there is good reason to believe, constructed the compass such as we now commonly have, a needle mounted upon a pivot, and enclosed in a box.

The Italian word for compass is bossola, which signifies box; and from this the French word for compass is derived, boussole, which also means box.

These were admirable improvements, and made such an impression that the improver is frequently spoken of as the inventor of the compass. The true inventor was the unknown man — when did he live, and where did he live? no one can tell — who first observed that a needle, rubbed by the magnet, has an inclination to point to the north.

One curious fact remains to be mentioned. The modern compasses, those used in the naval services of Europe and America, as well as by the Atlantic steamships, resemble in principle the needle and floating straw mentioned by Roger Bacon.

Ritchie's "liquid compass" has the needle enclosed in a thin, round metal case, air-tight, which floats upon liquid, and has also the support of a pivot. The needle, being thus upheld by the liquid, can be heavier, and thus have a more powerful directing force.

This we may call a return to first principles. So much for the history of the compass, which has doubled the area of civilization, and brought the two great continents within easy visiting distance of one another. A needle in a straw, afloat in a basin of water! A charm hanging at a lady's watch! A box with a card in it, suspended upon a pivot! What a little thing to be of such immeasurable value!

JAMES PARTON.

Minot's Ledge Light.

"There she towers! Spray clean over!"

Our party stood on the rough bit of New England shore which belongs to the government, and serves for "the base of supplies" to this, the most noted of American lights.

Minot's Ledge Light indeed deserves to rank with the first three or four in the world. Perhaps in point of peril in building, difficulty of construction, tragic history, cost, usefulness, picturesque beauty as a feature of the landscape, or the silent heroism of its attending, no light is its superior, not even the far-famed Eddystone, so inseparably connected with the name of its ingenious and daring builder, John Smeaton.

It was a dull-clouded, harsh midwinter's day. The merciless winds came in from the full Atlantic. The sea ran high in the protected bay hard by where we stood. Far out where the bluestone light was breasting the waves, the rush of the sea must have been tremendous against that moveless citadel of a beneficent government's watch and care for the sailor.

Behind us were the cottages where reside the families of the keeper and his two assistants. The children of the hardy men came timidly about us, bright and pretty. Plainly, though neatly, clad women showed faces at the cottage doors, and courteously directed us "up on the lookout hill" or "Beacon Hill," as another called it, whence the best possible shore view of the light could be obtained. As we clambered up the stones we asked all sorts of questions.

"You can signal from here out to your father on the light?"

"Yes."

"You often pass back and forth your signs, when the sea is heavy?"

"Yes. When any one is sick on shore father is informed of hopes or fears, how fares the sick one, by the dip of a lantern or the motions of a flag." Sometimes the father was

not well when it came his turn to go back to duty, and then the oldest boy would climb up every morning to Beacon Hill, to catch, with his strong young eyes and a glass, the faint, far signal from the light; "just to quiet mother," as he explained.

The lusty little chap seemed to think it was quite absurd to suppose such a father as his could be very sick out there, or die in his little round tower in full sight of home, though inaccessible to men at times, still more so to wife or child.

The Lantern.

The light stands upon a mere thumb of rock, which was hardly exposed even at low tide and smooth water, yet it was a couchant lion in the way of vessels entering or departing from Boston harbor.

Eighty-eight feet high the tower now springs up from the very midst of the waters. To debark from the boat on the light is never a simple task, generally perilous, and many days wholly impossible. The task of provisioning, in pleasantest summer weather, is one of great skill; of course everything, from a drop of water to a lump of coal or bottle of medicine, must be stored in the summer-time for the long, stormy New England winter.

In the centre of the tower is a well filled with fresh water, a gigantic cooler which, in the warmest weather, is delightfully efficient.

Not unfrequently the most skilful handling of a boat cannot prevent spilling provisions, and even the men, into this rushing, turbulent sea. A rope's end saves the bold keeper, and they pull him in and high up to the door, but the provisions must be replaced.

Two of the keepers, at least, are always on duty, while one is ashore taking a respite.

The men stay three weeks on the light out of every month; this gives each man one week with his family out of every

Minot's Ledge Lighthouse.

four, provided the weather is such as to admit transfers to be made. On the light one man is always awake and watching the great lantern.

A perfect meteorological and hydrographic record is kept; the wind, temperature, passing sails and their direction, floating wreckage, or any marine incident whatsoever. The writing of this "log," with necessary observation, is a welcome occupation to the lonely prisoners of duty.

Comfortable circular rooms occur in succession, one beneath another, from the lantern down to the solid base courses of stone. A fifth of the tower, from the rock, is dovetailed blocks of blue granite. Rooms are especially set apart for provisions, sleeping, cooking, charts and the like. Of course no exercise, except in a very limited degree, is possible in such narrow quarters.

The pay is not large. It varies somewhat under different administrations. The head keeper has never received over twelve hundred dollars per year; often he has less. Yet faithful men are never lacking who wish the situation — generally retired shipmasters who are able thus to eke out "the salt money" by such added earnings.

The assistants each receive much less than the head keeper. I asked a brother of a former keeper about life on the light. He said that a heavy sea was most trying at half-tide.

As the gigantic mid-ocean breakers strike downward on the ledge at the base of the tower, the shock is often tremendous. It may cause the stove-lid to rattle out of place, for instance, and makes the entire structure shudder.

The trembling gives a sickening sensation to one who is not accustomed to it, and is quite capable of taxing the strongest nerves. The recollection of the two brave keepers who perished when the previous light was swept out to sea must come to their adventurous successors.

My informant thought, however, that only two possible causes could occasion an overthrow of the lighthouse. Earthquake, or any disturbance of the foundation rock, would cause speedy ruin; so also, possibly, might a wreck coming

from the northeast at half-tide in a gale, the vessel being a gigantic battering-ram.

No rush of the sea, no storm of wind, no cloud of spray, often practically covering the entire structure for a moment—none of these poetic terrors of the ocean had any menace for the intelligent keeper.

There is a huge bell for fogs set in horizontally, in whose throat and across whose brazen lips a most curious and melancholy music is made by a gale of wind. The effect of the continual groaning and moaning of this unearthly voice, in deepest diapason, my informant mentioned as exasperatingly trying to the nerves at times.

He told me that the keepers are lovers of the sea, and always interested in the sublimity of that never dull point of prospect. Hours together they sit dreaming on old ocean, and communing with that great nature whom we all regard with wonder, but few of us see in such wonderful moods.

EMORY J. HAYNES.

Buoys.

All who have visited the approaches to a seaport town have noticed the numerous buoys and marks which are placed there as aids to navigation.

Tugging and jerking at their chains as the tide sucks in around them, or lying quietly upon the placid waters of some sheltered bay, are black buoys and red buoys, buoys with horizontal black and red stripes, buoys with black and white vertical stripes, and ding-donging bell- and whistling-buoys. Well out to sea lie much larger buoys, called mammoth buoys, gripping the sand with their iron claws.

Though these marks and buoys may seem to have been put haphazard here and there, each has a meaning. The place that each shall occupy is carefully chosen for it, and its arrangement is governed by a careful system.

These aids to navigation, which are called "day marks" in contradistinction to the lights and beacons, fall under the jurisdiction of the Lighthouse Board.

The coast of the United States, including the lakes and navigable rivers, is divided into sixteen districts. A naval officer is in charge of each. Under his direction all the buoys in his district are placed.

In all the districts similar buoys mean the same thing, and a buoy that has a particular distinguishing color on the coast of Maine has the same significance if in the Bay of Mobile or off the coast of Oregon. So the mariner who sails into Boston Harbor is guided and directed exactly in the same way as he who enters the Golden Gate.

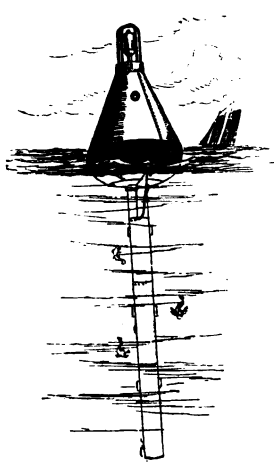
Not only are the colors and positions of the buoys given on the Coast Survey Charts, but the Lighthouse Board publishes a yearly list, which is distributed gratuitously for the benefit of commerce, in which each of its about five thousand buoys is located and described.

Coming into port from sea, the first buoy that we pass may be a mammoth buoy. I say "may be," because these buoys are only used in special cases, such as to mark the approaches to channels over bars or shoals that lie at a considerable distance from the coast. The entrances to most harbors do not require any such special marks.

The buoys that designate the channel, and which lie on either side of it, are red and black. The red buoys, which all have even numbers, must be left on the starboard or right hand in passing in from sea, while the black buoys, always with odd numbers, must be left on the port hand.

In case there are two or more channels, they are distinguished by a difference either in the size or shape of the buoys.

If there should chance to be an isolated rock, wreck or any obstruction which has a channel on either side of it, it is shown by a buoy painted with red and black horizontal stripes.



The Whistling Buoy.

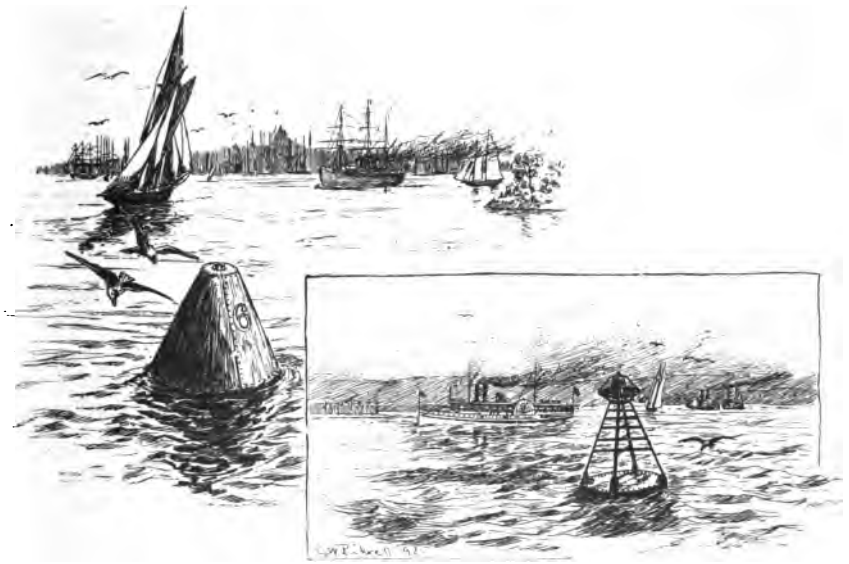
Buoys with white and black perpendicular stripes lie in mid channel, and indicate that they must be passed close to avoid danger.

Finally, buoys surmounted by triangles, cages, and so forth, are an indication that there is a turning point in the channel.

There are, in addition to the buoys already mentioned, two other kinds which are also fog signals, namely, the whistling buoy and the bell buoy.

Whistling buoys are more complicated affairs. They are only seen at harbor entrances, or off some prominent point. What one sees in coming upon a whistling buoy is an object that looks much like a big red pear, afloat upon the waves. But a closer view shows that the pear is of the size of a hogshead, and that

at its upper end is fixed a whistle, connected with the pear bulb by a tube. Now if one could see down into this painted bulb, the big stem which runs through it and down into the sea for about thirty feet would be found to be nearly a foot in diameter.



This long pipe is open at the bottom and closed at the top. As it sits in the water, therefore, there is a water-line inside the pipe, just as there is outside. The buoy may dance up and down as much as it pleases, but the big column of water inside the pipe does not dance, but remains perfectly still, because there are no waves down below, where it enters, to affect it. As the buoy goes up on a wave, pulling the pipe up with it, it leaves, of course, a longer space of pipe above the water-column, and a consequent partial vacuum. When the buoy falls, the air above the water is compressed again.

Perhaps the simplest explanation of this movement is to say that the water-column and the rising and falling pipe around it are piston-rod and cylinder, and their motive power

is the restless Atlantic swell. There is an air-tube connecting above with the pipe, and when the rise on a wave makes the vacuum within, the outer air hastens to fill it. Then, as the pipe goes down, making the air press down on the resisting water, an outlet is provided for it in a small middle tube, which runs up from the pipe directly into the whistle fastened atop, high and dry above the waves. The rushing upward air that follows every plunge of the buoy is like the breath from the lips of some great strong sea-giant blown into the whistle.

The blasts, of course, vary greatly with the kind of sea. After a storm that creates a heavy swell, the buoy rises and falls very slowly, and the whistle sounds with a long and mournful wail. But in a brisk breeze, the buoy bobs merrily up and down on the quick, choppy waves, and the whistle goes with a cheery "Toot! toot! toot!" not at all suggestive of shipwreck and disaster.

They are not pleasant neighbors. Their sound is frequently heard at a distance of ten miles, and under very favorable circumstances it has been heard fifteen miles.

The bell buoy consists of the bottom section of a buoy floating in the water, on which is mounted a framework bearing a bell which, instead of the ordinary tongue and clapper, has a small cannon-ball supported on a platform just underneath the bell's mouth. This ball rolls to and fro with every motion of the sea.

These buoys are used in harbors and rivers where the water is smoother than in the roadsteads, and where it is not necessary that their sound shall be heard a great distance. Ordinary buoys, not of the whistling or bell variety, are made of either iron or wood. Those of iron are hollow, with air-tight compartments, and are of three shapes, called respectively nun, can and ice buoys.

The nun buoy is almost conical in shape; the can buoy approaches the cylindrical form, and the ice buoy is very long and narrow, and resembles the spar buoy in form.

The wooden, or spar buoys, are sticks ranging in length

from twelve to sixty feet, and painted according to the uses to which they are to be put. The lower end is fitted for a mooring chain.

A buoy has many vicissitudes, and is exposed to many dangers. Passing steamers run down the iron buoys and rip them open, or cut off big pieces of spar buoys with their sharp propeller blades.

As the iron buoys are made in compartments, they are seldom sunk by such collisions, but their line of flotation is often so lowered that they have to be replaced.

Again, despite the fact that the United States laws punish by a fine of one thousand dollars any one who is convicted of unlawfully injuring any work for the improvement of navigation, — and this in addition to other penalties provided for by the different states, — the very people for whose benefit these buoys are laid often unlawfully make fast their vessels to them, and drag them out of position.

Again, the ice, floating down in masses, parts the mooring chain, or tears the mooring anchor from its hold and carries the buoy far out to sea, to break upon the horizon of some astonished mariner there.

There is now, or was until recently, a buoy anchored off the coast of Ireland which made the journey there from New York harbor in six weeks. When it was picked up off the Irish coast, the Irish Lighthouse Establishment reported the fact to our Lighthouse Board. Then it was presented to the Irish Board, who thereupon added their characteristic marks to those already upon it, and moored it near the spot where it was found. Few persons realize the enormous extent of our coast-line along which lighthouses and buoys have to be placed for the benefit of commerce. Under the head of the "General Seacoast of the United States" there are, on the Atlantic Ocean, more than two thousand statute miles; on the Gulf of Mexico more than eighteen hundred, and on the Pacific Ocean an almost similar extent; while Alaska has nearly forty-eight hundred miles of seacoast.

Including the islands, bays, rivers, etc., to the head of

tide-water, there are on the coasts of the Atlantic Ocean nearly thirty-seven thousand statute miles; on the Gulf of Mexico nineteen thousand; on the Pacific Ocean nine thousand, and in Alaska twenty-seven thousand.

Add to this three thousand miles of lake coast and five thousand miles of navigable rivers, and we have a grand total of nearly one hundred and ten thousand miles of coast which has to be looked out for, and guarded in some degree.

W. F. Low.

The Pilot-Boat.

Most people who have traversed Massachusetts Bay in summer recognize as pilot-boats the jaunty craft distinguished by a black number painted in bold relief against their sails; but few have a correct idea of the duties of these boats, or how they are performed.

Boston Harbor, a portion of Massachusetts Bay, has, strictly speaking, a mouth about three and three-fourths miles in width, extending from Deer Island to Point Allerton. But the true approaches to this harbor are five channels, one of which, the main ship channel, is used by almost all incoming vessels. It has its least width at a point called the Narrows, situated not far from the mouth, and marked by a lighthouse.

Though this passage is well marked with lights by night and buoys by day, the captain of a vessel with a precious cargo of freight and passengers is seldom willing to take the chances of running his craft upon some hidden ledge or bar. He generally prefers that a regularly licensed pilot shall take charge, and bring his vessel safely into port.

The United Colonies early recognized the need for pilots, and passed stringent laws for their support and regulations for their guidance. The earliest pilots put out in small rowboats from Pollock's and Brewster's Islands, boarding the small vessels of early days with comparative ease and safety; but as steam supplanted sail, the rowboat developed into the swift and stanch schooners of to-day, which often go two hundred or three hundred miles out, and even to Halifax.

Before the pilot of the present day can be entrusted with his warrant to perform the duties incumbent upon him, he must serve a long period in the pilot-boats as a sailor, or "boat-keeper." After he has served this apprenticeship for a sufficient term, he applies for a commission.

If his employers, the pilots, recommend him, and he can

pass an examination before the Pilot Commissioners appointed by the government, a warrant is given to him which entitles him to take into port vessels which draw a limited number of feet aft. Later, if he has performed his duties satisfactorily, he receives his full commission to act as pilot upon vessels of any size.

The pilot is paid by the owners of the vessel at a fixed rate of so much a foot for every foot the vessel sinks into the water

Outward Bound.

at the stern. He does not pocket the amount, but puts it into the common fund of the earnings of all the pilots attached to the boat to which he belongs. This fund is used, first, to pay the expenses of running the boat, and all that remains is divided equally. The boat may be owned by the pilots or by outside parties.

Vessels take a pilot out as well as in, usually from the same boat from which the inward pilot was taken. To take

the outgoing pilot off the vessel, a boat is always on duty at what is called the Inner or Hull Station, which is within certain defined lines outside of Boston and inside of Minot's Light.

The boats perform this duty in regular order, according to their numbers, and remain on duty here one week at a time, from Monday noon until Monday noon.

The boat on station flies a flag at the masthead by day, and at night carries a white light and no side lights. The station boat cannot board vessels outside of station limits, and is obliged to take pilots out of all outgoing vessels.

The number so conspicuously displayed on a pilot-boat's mainsail is worn in obedience to law. Its purpose is to inform captains that the boat is a licensed pilot-boat.

Besides the Hull station, there is another at Cape Cod, to which each boat goes from the Hull station after coming to the city to refit.

When not upon station duty the boats are free to go where they will, and the pilots show rare judgment in selecting a spot where ocean travellers are likely to come into view. Their sight is trained to wonderful keenness.

Coastwise vessels, both sail and steam, are not required to take a pilot, but all vessels from foreign parts must pay pilotage dues, whether they take on a pilot or not. Incoming steamships are watched for eagerly in all weathers, and often boarded far out at sea. The first sign of smoke is noted, and while the landsman is trying to steady the glass so that it will not hit the zenith or the sea, as the boat jumps, the pilot is often telling the name of the coming ship. Then the horizon is swept for rival pilot-boats. Every tiny speck of white is scanned and noted, for although the pilots of each boat act in accord, the boats compete with one another, and have many exciting races for ships.

The crew of a pilot-boat, when she leaves Boston on a cruise, consists of her pilots, four boat-keepers and a steward. The pilots occupy the cabin, and the one whom the rotation has designated to be the first one to board a ship takes

Boarding a Vessel.

The Pilot-Boat.

command. As soon as the boat passes Boston Light he sets a constant watch, which is kept day and night. The other pilots read, play cards and sleep; but this one whose turn it is to go may be required on deck day and night.

The four boat-keepers stand regular watches and perform the duties of a sailor, handing, reefing and steering.

The boat is sailed to what is thought to be the spot where an incoming steamer is most likely to be met; and if no other boat is in sight, she is hove to — that is, kept swinging as on a pivot, her head sails aback, and the rudder turned against them. If nothing comes in sight another place is sought; and the vigil is not relaxed by day or night. Meanwhile, the watch is busy at the many bits of work always needed.

Perhaps after a long, monotonous wait the cry is raised, "Smoke to east'ard!" Then all is excitement. Pilots and crew are alike astir. The flag is set, and if another boat is near, a race as exciting to its participants as an international regatta ensues — a race for money and for home.

Perhaps the pilot in charge exclaims in a disappointed tone, "Haul down your flag!" What does it mean? Simply that he has discovered a flag aft on the steamer, and knows that she has been boarded by a pilot. But if this does not occur, and his boat wins the race, he keeps on until close to the great steamer. Then the command is given, "Get your canoe ready!" On each side of the pilot-boat's fore hatch is kept a rowboat, which is called in Boston a "canoe," and in New York a "yawl."

The lee canoe is righted and shoved over the low rail. Two boat-keepers and the pilot get in; and as the pilot-boat, which is now in charge of the second man to go out, passes the steamer, the canoe is let go and speeds away.

The pilot climbs up the steamer's towering side by a spider-like ladder, the canoe drops astern, and the pilot-boat is rounded to and picks it up.

The process of seeking vessels and putting pilots aboard them is repeated until every pilot has gone. When the last pilot has departed, the boat is perhaps one hundred and fifty

miles at sea, but at all times its position, the distance to Boston Light and its direction are known. The position is kept by "dead reckoning" when the weather prevents daily observations from being made.

When the last pilot is out, the first boat-keeper takes command, and brings the boat back to Boston as speedily as he may, to take its own pilots on board again and begin another cruise.

As the first boat-keeper has command in all weathers, and as his boat draws from twelve to fifteen feet, he soon learns to be both a good sailor and an experienced pilot. When a pilot boards a ship the master of the vessel yields all responsibility to him, and follows his instructions.

This is the pilot's life. Like all others, it has its bright and dark side. He is away upon the ocean, he enjoys refreshing breezes in hot weather, and on the whole lives a healthful life, which, in the summer, may be delightful.

But he is exposed to many dangers, to fatigue, to cold and terrible winter storms. He has long and tedious waits both on shore and at sea, and many disappointments. In thick weather he is in the track of steamers, and in danger of being run down; in winter his boat is covered with ice, and he has to trust himself to a cockle-shell, and perform perhaps an extremely dangerous task in boarding a vessel.

Some of the pilot-boats have been dismasted. All have lost booms and split sails. Sometimes they are crippled, and drift for days covered with ice, until they resemble small icebergs; but they are stanch boats, and seldom go down.

In winter, when the howling northwest gale or driving snow-storm roars in our ears, and we incline to grumble at our lot, it may be well to remember that out upon the angry ocean many a little pilot-boat may be tossing and plunging, braving all danger in the duty of aiding fellow-mariners to avoid the perils of our coasts.

W. EUSTIS BARKER.

An Ocean Guide-Post.

The island of Nantucket, twenty-five miles south of the southeastern corner of Cape Cod, is surrounded by shoals, the most extensive and among the most dangerous along the Atlantic coast of the United States. These shoals extend from the east and south sides of the island for a distance varying from ten to twenty miles. At some places they rise almost to the surface of the sea, but in most instances they are far enough under water to allow a vessel of ordinary size to run some little distance upon them before striking.

Formerly vessels were pounded to pieces on these shoals every year. Now vessels are seldom wrecked there, partly for the reason that light-ships have been stationed at the most dangerous points in the ordinary tracks of shipping, and partly because the shoals are more accurately laid down on the later charts.

The most southeasterly of these shoals lies in the track of the great transatlantic steamers plying between New York and the ports of Great Britain, Germany and France. Part of this group is known as Davis's New South Shoals. Just at the outer edge of them — twenty-four miles from Siasconset, the nearest point of Nantucket, and something over fifty miles in a straight line from the mainland — is anchored the South Shoal light-ship.

This ship heads for no port, makes no harbor, nor seeks the protection of a lee shore, no matter how hard the storm, how fierce the gale. It is perhaps the loneliest habitation in the world, and the crew are more isolated than any body of men on all the wide ocean.

Year after year they are tossed and beaten by immense ocean waves, a living guide-post on the trackless sea. All day and all night, day after day, year after year, this little body of nine hardy seamen keep watch, lest some ship come

too near them and meet its doom. Often they are forced to warn others to keep away, when their own hearts are yearning for news of the world and their homes.

During the summer the government lighthouse tender visits the ship occasionally to carry supplies. When she steams into the harbor of Nantucket and announces that she

Signalling the Light-Ship.

is going to the South Shoal, the news spreads rapidly over the little town. Many letters and greetings are hurried to the steamer that will carry them to the anxious husbands and fathers on the light-ship. At that season the weather is nearly always calm, and passing vessels are often spoken by the crew of the light-ship, who sometimes send out a boat with letters for their friends ashore.

These letters may be carried from almost within sight of

their destination to some port hundreds of miles away, and thence returned by the regular mail to Nantucket. In some instances they have been carried as far as Baltimore.

Another remarkable fact is that none but foreigners ever speak the light-ship. American vessels pass by unheeding. Perhaps the captain never reflects that some cheering attention is fairly due to the men who may at some time save his vessel from destruction and himself from a watery grave.

Foreign ships if hailed always lie to, and give what news they can to the crew. About the first of December the last trip for the winter is made by the tender. Then begins for the light-ship's crew a dreary, long period, varied only by the sea washing over the ship more to-day than yesterday, or the compass shifting more speedily as the ship heaves and tugs at the great chain cable, and circles around her monstrous anchor of three and a half tons' weight.

When the long winter, with its snow and ice and storm, passes and the sun of spring once more warms the air, the tender again starts out to visit the vessel, and carry to the crew the first news which they have had from the rest of the world for months.

The South Shoal light-ship is not a large vessel. She is only one hundred and five feet long over all, and twenty-four feet across the widest part amidships. Her depth is but twelve feet. The distance between decks, which is the living space for the crew, is much less.

She is rigged with two short masts. Near the top of each is a circular beacon to mark her as a light-ship by day; at night a large octagonal lantern is hoisted up on each mast.

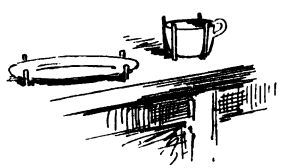
These lanterns hold eight powerful lamps each, with reflectors so placed that they completely encircle the mast, which passes through the centre of the lantern. So strong is this light that it can be seen eleven miles away in clear weather. The duty of the crew is to clean, trim and fill these lamps every day, and to keep them burning at night.

From a little house on deck called the lantern-house those of the crew who are on duty watch the lamps all night. In

the storms of winter they are obliged to keep brushing the snow from the glass fronts of the lanterns, which in very cold weather must be lowered at short intervals that the ice may be broken off in order that the lights may not become obscured or the lanterns frozen to the mast.

The hull of the light-ship is built double for extra strength, and is constructed on principles best calculated to resist the eternal beating of the waves. A ship which sails the sea gives way in some degree to the force of the swell, as it rises and falls with the motion of the water; but the anchored light-ship must meet unyieldingly the pressure of every wave. As each roller strikes and the anchor chain tightens with a jerk, the shock is terrible. The pitching is so great all the time that the bunks in which the men sleep are deep canvas bags slung between two high wooden sides, in order that the sleeper shall not be thrown out.

Everything has to be fastened securely in its place. Cooking utensils are chained on the stove. Plates and dishes are confined to the table by pegs, which are driven around them, and even the men's shoes, when taken off at night, must be tied to something or they will be hurled all over the cabin.

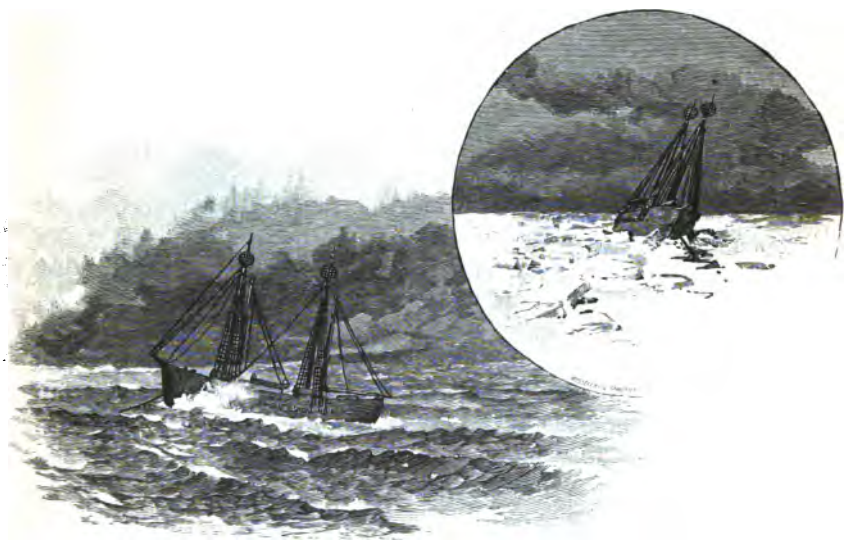


Sometimes the vessel rolls so much that the boats, which hang on davits over the sides higher than a man's head above the deck, are submerged, and come up full of water.

There are nine men in the crew, including the captain, mate and cook. The captain and mate are known as the keeper and assistant keeper.

In summer, when half the crew by turns come ashore for a rest, a tenth man is added, so that there are always four men and one officer aboard. This force is not enough to handle the ship in times of danger. Five men can barely handle the great anchor chain, which is a little over six hundred feet long, each link weighing twenty-five pounds.

The cheerless life of these stationary mariners is seldom given a thought by those who are returning from abroad in the great ocean palaces; and yet perhaps they owe their very lives to these men at the South Shoal. Often in the darkness of a stormy night a big steamer, with hundreds of passengers aboard, plows her way through the trackless deep when all



In Storm, and Winter.

the fury of the ocean seems directed toward her destruction, and a single touch upon these hidden shoals would seal the fate of every soul she carries.

But as she approaches the danger two twinkling lights warn her off, and she is guided safely past. Not always, however, do ships pass the shoals in safety. Sometimes the fog is so thick that the lights cannot be seen nor the fog bell heard. At other times, for one reason or another, a vessel cannot be controlled.

Often the only tidings of the disaster which the world receives are pieces of wreckage seen afterward by other

vessels, or picked up at Nantucket. Others, though wrecked, are more fortunate. Many rescues have been made by the light-ship men from vessels which went down within their view.

Sometimes the storms are so severe that even the light-ship parts her cable of two-inch iron, and drifts away. This is the time of the crew's greatest danger. Such sail as circumstances will permit must be set, and the strictest watch kept until some haven is reached. The vessel is not built for sailing, and can do little better than run before the wind, in the effort to reach some port.

Eight times within the twenty years during which the present captain has been aboard, she has been adrift. Fortunately the gale was every time from such a direction that the crew were able to run for Martha's Vineyard, and get under the protection of Gay Head. When the storm is over the tender takes her back to the great can buoy which marks her station.

Should the light-ship break away under the force of a wind which will drive her upon the shoals, the wreckage on Nantucket's shore will tell the news that she has gone down with all her men, how or when, no living soul would ever know.

For a quarter of a century the crew of the South Shoal light-ship have employed their leisure moments in making a peculiar kind of basket, known to those who visit Nantucket as light-ship baskets. Some are made on shore by men who have served aboard the ship, but these are few compared with those made on the ship.

The baskets originated many years ago when Nantucket was full of busy ropewalks. These establishments used great quantities of manilla, which came in bundles tied with strips of rattan. Some one began to use the strips to make baskets in imitation of those which returning whalers often brought from some of the islands of the Pacific Ocean.

They were probably the first rattan baskets ever made in America, and being, perhaps, the only kind made at Nantucket,

were naturally the kind worked at by the light-ship men when they began to divert themselves with basket-making. At first but one or two of the crew worked at them, and their products were very rough when compared with the neat baskets made to-day. Now every man aboard is an expert basket-maker, and about five hundred are sold by the stores in Nantucket each summer for the crew.

Although the proximity of the Gulf Stream equalizes the temperature so that it is several degrees cooler in summer and warmer in winter at the South Shoal than at Nantucket town, on the north side of the island, there are times when nothing is visible around the vessel but a continuous field of drifting ice. On this ice multitudes of seals are sometimes seen, but they perceive danger quickly and disappear before coming too near the crew.

Making Baskets.

A few winters ago, no water was seen for more than a month — nothing but a solid pack of great white cakes of ice, which rose and fell with the swell of the ocean, as they slowly drifted past, day after day. As if to compensate for such utter loneliness, there are occasional days when a mirage forms, and the crew can see the shores of Nantucket as plainly as if they were only a few miles away. Sometimes they can make out clearly the little village of Siasconset, the headlands and gullies, and even the dories on the beach. There is great joy among the crew when this occurs, for it is almost like good news from home.

HARRY PLATT.

An Ocean Observatory.

There is no sight more common in New York harbor, unless it is the ordinary passage of a Brooklyn or Jersey ferryboat, than that of puffing tugs or large-decked excursion steamers, carrying noisy and expectant crowds to meet an incoming ocean steamer. Every day, dinners of welcome are prepared, or carriages ordered at the dock, in readiness for the arrival of friends or distinguished guests from across the Atlantic.

How is the near approach of the steamer made known to those ashore? How is it that New York is aware, seven hours before she gets in, of the coming of an Atlantic liner, no matter whether her passage has been a quick one or a slow one? One would think that owing to the uncertainties of tide and winds, the arrival of the vessel could not be computed within two or three days; and yet persons as far distant from New York as Philadelphia or Albany are apprised of the near approach of a certain ocean steamer, and may arrive in season to welcome incoming friends.

The matter is easily explained. The first strip of American coast sighted by the majority of incoming steamers is Fire Island, which is about forty miles from New York City. It is not, in spite of its name, an island; but it is the end of a long and narrow strip of land which lies between the ocean and the great south bay, on the southern coast of Long Island. The beauty of its scenery and the attractions of the shore have made Fire Island a popular seaside resort.

For nearly ten years it has served as a place for marine observations. From the top of the large Surf Hotel a magnificent and far-reaching view of the ocean is obtained.

Such good results were obtained from this point of vantage, in the sighting of distant vessels, that a more extensive and systematic use of the ground was suggested. There was

ultimately erected near the beach, by the Western Union Telegraph Company, a high wooden tower, from whose top observations can be made to a distance of more than twenty-five miles from shore. The structure was suitably arranged as a dwelling-place for the observer, and instruments and the latest modern facilities for watching and reporting of vessels were brought into use. Telegraphic and telephonic communication was also employed.

The observatory is a wooden building about forty feet high. It lies back from the beach about two hundred feet, and all about it is a waste of sand. The tower is pyramidal, and has a row of windows on each face. The lower floors are used for dwelling purposes, while the topmost room serves as the observatory proper.

Windows open on all four sides of this small room, and lookout apertures face oceanward. A telegraph instrument stands in this apartment, and is connected by wire direct with the principal office of the Telegraph Company in New York City.

Upon the walls of the room are pictures of all the best known ocean steamers. These pictures, it might be supposed, would assist the observer in making out the vessels which come in sight. It is a remarkable fact, however, that the observer in charge has never been on board any of these steamers, and can distinguish them only at long range.

From his knowledge of a steamer's average rate of speed the watcher approximates her hour of arrival, and thus fixes the time when he should be on the lookout. He has special means of distinguishing them at night. Upon arriving opposite Fire Island, each steamer sends up a rocket as a signal. Each line of steamers has its peculiar system of signalling. The Cunard steamers, for instance, burn two Roman candles, showing six blue balls. The Inman line signals with two blue and red lights, followed by a rocket showing blue and red stars.

Of course these signals indicate only to what line the steamer belongs. To distinguish a particular vessel, it is necessary to observe carefully the side and stern light. As

soon as the steamer comes in sight, the observer must fix his gaze steadily on the lights until the signals are sent up; and he must know these very well.

The work of observing passing steamers, and telegraphing the name of each to New York, may seem quite easy; but when one considers the fact that the majority of the vessels are from fifteen to eighteen miles from shore, and that many pass by at night, and during fogs and cloudy weather, the skill and training necessary for the work become more apparent. Rocket-signalling is, of course, effectual only at night. When a vessel happens to sail past Fire Island during the day, another method of signalling is employed. Combinations of colored flags are hoisted by different lines of steamships. But, as color is distinguishable only at a comparatively short distance, this method fails at times; and then the observer must fall back upon his trained

An Ocean Observatory.

sharpness of sight, and his knowledge of the peculiarities of different steamers. Thus the general outlines of the vessel, the position of its smoke-stack, the number and positions of its life-boats, the shape and number of the sails, and many other individual marks are depended upon for a correct determination of the name of the vessel.

Upon the smoke-stack of the steamer "Servia," for instance, is painted a square white mark, while on a certain other vessel of the Cunard fleet, the corresponding mark is oblong. Certain vessels are recognized by their peculiar fashion of carrying their sails.

Sometimes the watcher distinguishes a vessel by the color of the smoke arising from her stack. One line of steamers burns a certain kind of soft coal, the smoke from which is unlike that made by any other coal. In such a case, the approach of the steamer is known before any portion of the vessel itself is above the horizon. Indeed, the sharp-eyed observer often astonishes his visitors by informing them that he has already seen and telegraphed to New York the near arrival of the vessel, when no trace of the approach of the steamer has been perceived by them.

Each line of steamers has its own course. Thus the angle of observation used by the observer, in watching from the port-hole of the tower, often tells him to which line an incoming steamer belongs. From one port-hole in the lookout room the observer catches his first sight of a steamer of the Guion line; from another, a vessel of the White Star line, and so on.

Life at Fire Island during the long winter months is exceedingly lonely. Communication with Bay Shore, about ten miles distant, the nearest point on the main land, is had only a few times a week. The keeper of the neighboring lighthouse, with his family, and the life-saving crew, are the only neighbors the observer has.

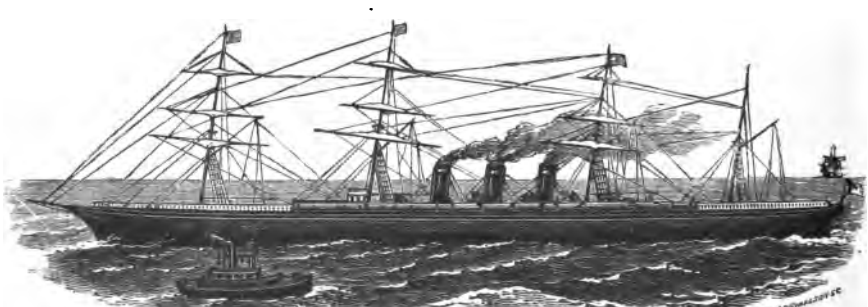
This isolation is compensated for by an abundance of company during the summer months, when the observatory is one of the chief attractions at Fire Island. The visitors at the hotel flock to this snug lookout retreat, and avail themselves

of the opportunity to look far out to sea. When the observer takes a leave of absence, which is very seldom, the observatory is closed. There is no one else who possesses the special training necessary to make the reports accurately. Serious complications might result from the wrong reporting of a vessel. The present observer has made but one error, and that was when a new steamer on a German line had been despatched to take the place of another, without the watcher's knowledge. He reported the new vessel under the name of the old one.

The desire of the captains of the fast lines to make as quick a passage as possible leads them to sail the straightest course for New York. This takes them farther away from Fire Island, and increases the difficulty of observing them.

From the Fire Island tower came the first report of the "Oregon" disaster, which occurred in March, 1886. The ill-fated vessel was observed about nineteen miles from shore, behaving strangely. The observer, supposing that something was wrong, telegraphed his conjectures to New York at six o'clock in the morning. Soon thereafter the steamship "Fulda" signalled him, by means of flags, this message: "Steamer 'Oregon' sunk. Passengers all on board the 'Fulda.' All well." This was the first definite information to reach New York.

H. F. GUNNISON.



Anchor Line Steamship "City of Rome."

The U. S. Life-Saving Service.

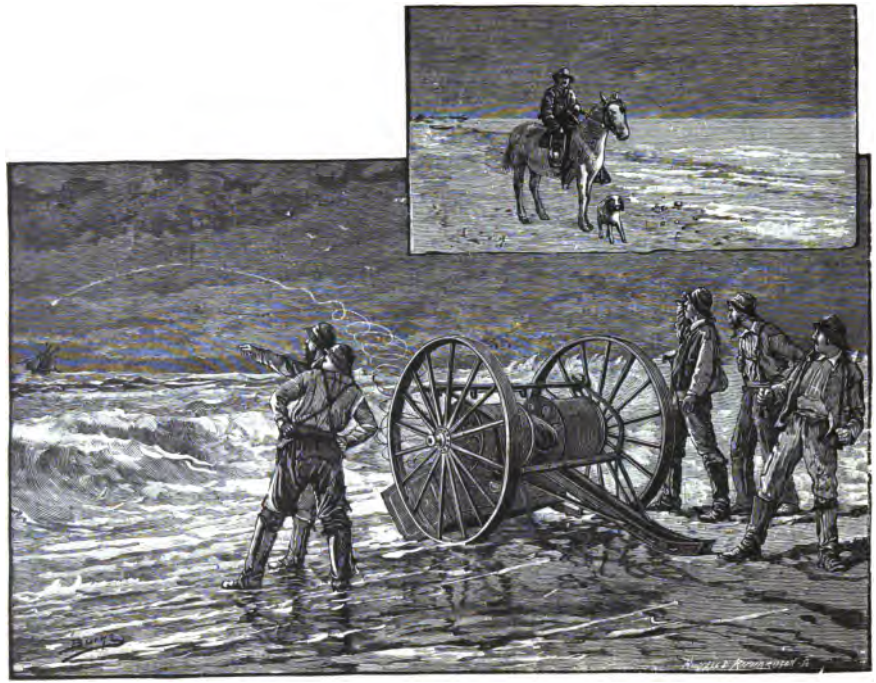
Ever since the times of antiquity, more or less attention has been given to the saving of life from the perils of the sea. The Chinese, centuries ago, formed the first humane society for this purpose, and to-day these institutions can be found throughout the whole of civilized Europe.

In our own country as early as 1785 steps for the preservation of the shipwrecked were taken by a number of benevolent gentlemen in Boston, who formed the Massachusetts Humane Society, and built huts of refuge and several stations equipped with life-boats on the desolate portions of the coast of that State.

The development of the United States Life-Saving Service covers about forty years. Beginning in 1848, the government erected some twenty or more houses, furnished with appliances for rescuing life, on the exposed shores of New Jersey and Rhode Island, though it was not until 1871 that the present elaborate system of relief, which has grown to be the most perfect of its kind in the world, was introduced.

There are now upon the ocean and lake coasts of the United States about two hundred and forty-four life-saving stations. They are picturesque, two-story pine houses with gable roofs, and are fitted for the comfortable accommodation of the crews, and the reception of the life-saving apparatus. On many portions of the Atlantic coast they are not more than five miles apart, and are located at dangerous and exposed points. These are manned from September 1st to April 30th, the season of most inclement weather; in the lake region the stations are kept open during the continuance of navigation.

The keeper captains a crew of from six to eight surfmen. His position is one of grave responsibility, requiring sound judgment, a cool head, and unflinching courage. He must be a man well-trained in his vocation, of correct habits, and



Beginning the Rescue

able at all times to command the utmost respect and obedience of his men.

Both keeper and crew are chosen from among the sturdy fishermen that dwell on the shores in the vicinity of the station, and who have lived from childhood within sound of the surf. A lifetime experience on the beaches and adjacent waters inures them to the perils and hardships which obtain along the coast, and makes them thoroughly familiar with the bordering currents, tides and places of danger. From occupation they are necessarily skilled and fearless surf-boatmen, and all possess an excellent knowledge of every part of a ship, largely acquired through wreck operations.

In the day a strict lookout is kept seaward for distressed craft, and during the interval of night between sunset and dawn, the patrolman maintains a steady vigil along the beach. At the beginning of their watch two surfmen go forth in either direction, and follow the shore until they meet the patrolmen from the adjacent stations. Of course, when the latter are remote from each other this scheme is not practicable, and the limit of the beat is then otherwise regulated. Thus it will be seen that along almost the entire stretch of seacoast, a faithful line of sentinels is strung out steadily tramping the surf-washed sands on the watch for imperilled vessels.

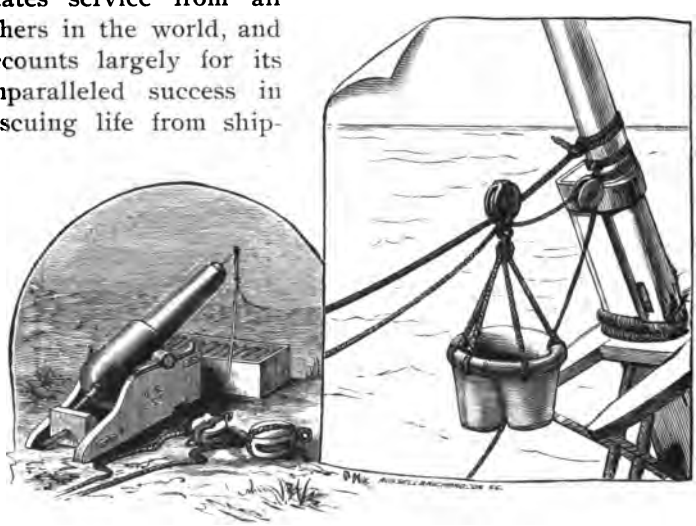
Each man carries a Coston signal which, when exploded by percussion, emits a red flame that flashes far out over the water and warns the unwary ship, approaching too near the breakers and outlying shoals, of impending danger, and to stand off, or assures the shipwrecked that help is close at hand.

The duty of the beach patrolman is always arduous and often terrible. A solitary tramp on the dreary beaches is a task at any time. What is it then in the worst conditions of wind and weather, against cutting sand-blasts, in drenching rain and flooding tides, surrounded by darkness, and deafened by the roar of the storm, with quicksands and pitfalls along the path?

Not unfrequently the weary marcher becomes exhausted and bewildered in his journey, and many times cannot stand

up at all against the fury of the tempest. Yet it is wonderful how these undaunted men plod and struggle on from a sense of duty, seldom faltering, and never once giving up unless from sheer lack of vital energy.

The beach patrol system by which stranded vessels are so promptly discovered is a feature that distinguishes the United States service from all others in the world, and accounts largely for its unparalleled success in rescuing life from ship-



The Lyle Gun and Breeches-Buoy.

wreck. At certain stations where the shores are of such a nature that operations can be facilitated by the use of horses these animals are supplied, and the patrolmen on extended beats often go mounted.

There are five principal appliances that are used for saving life from shipwreck. The first of these is the cedar six-oared surf-boat, which is the only boat that has yet been found suitable to launch from flat beaches through the shoaling waters of the Atlantic and Gulf coasts. It is provided with air-cases which make it insubmergible. This boat being comparatively light can be hauled long distances on its carriage abreast of wrecks. Its action in the hands of expert oarsmen

is often marvellous, and although easily capsized there are not many instances on record in the service where it has been upset with fatal results while passing through the surf.

Another contrivance is the self-righting and self-bailing English life-boat, which embodies the best elements of the boatmaker's skill. It is of great strength and stability, though heavy and cumbersome, and is only adapted to use along steep shores, or where it can be launched directly into deep water.

When boat service is impracticable, resort is had to wreck ordnance. A small bronze smooth-bore gun, named for the inventor, Captain Lyle of the army, is the appliance now in general use. By means of this piece a line is fired over the vessel, and the proper gear hauled off. Communication is then effected either by the life-car or breeches-buoy.

The life-car is made of galvanized sheet iron, and is shaped like a covered boat. It is capable of carrying five or six adults at a time, and is used when a large number of people are to be saved. It has frequently been employed with marked success, and at its first trial two hundred and one persons were rescued from the wreck of the "Ayrshire," on the New Jersey coast, when no other means could have possibly availed.

The breeches-buoy, on account of its being much lighter and easier to transport and handle is, however, more commonly used, as the greater number of vessels now stranding on our coast are manned by crews of from six to ten men.

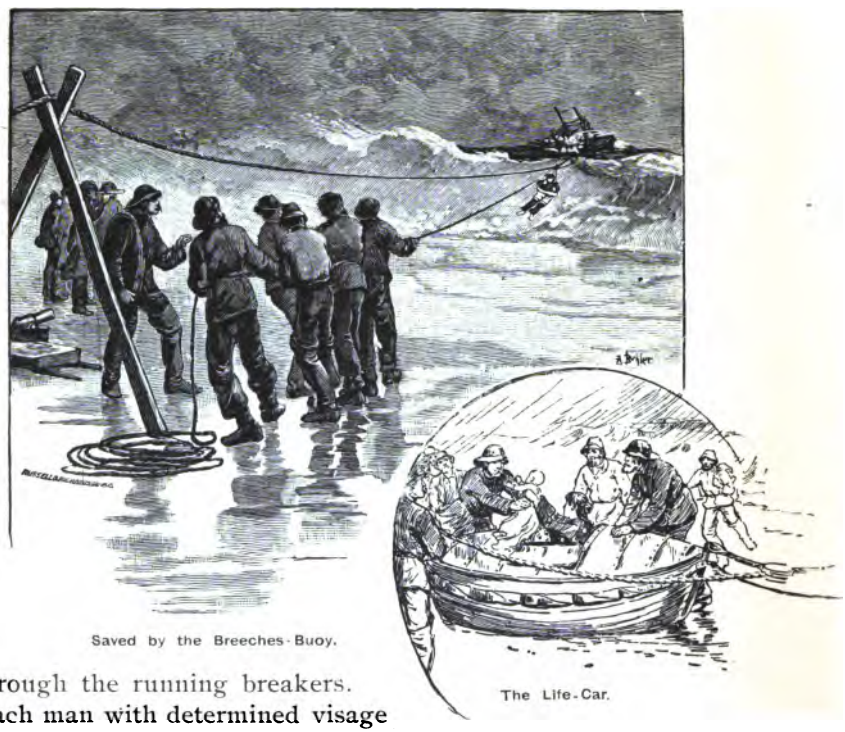
This contrivance is nothing more than a circular life-preserver of cork to which short, canvas breeches are attached; it is large enough to hold two persons, and is operated similarly to the life-car by being suspended from a hawser, and drawn back and forth with lines.

When the beach patrol at night or station lookout in the day discovers a vessel ashore, he takes instant measures to alarm the crew. The condition of the weather and surf will always indicate to the keeper whether a rescue should be attempted by the use of a boat, the life-car or breeches-buoy.

Perhaps the boat must be hauled by the men on its carriage

through the soft, yielding sand many miles, a task that frequently requires the most arduous and persevering toil. There is always the difficulty and danger of making a launch through the treacherous seas that tumble and burst along the beach with such resistless force.

This struggle over, the height of human skill and courage is required to guide the buoyant craft on its errand of mercy



Saved by the Breeches-Buoy.

The Life-Car.

through the running breakers. Each man with determined visage watches the keeper standing at the steering oar, and is responsive to his every movement and gesture. Many trials may have to be made before the vessel is finally reached, and then comes the adroit manœuvre to prevent collision with the hull or injury from floating wreckage and falling spars. The imperilled people, often driven by the raging seas to the

refuge of the rigging, clinging there, perhaps, benumbed and exhausted, are taken off as chance offers, and with a heavily laden boat, the run is made for the shore on the top of swift-rolling combers.

In case the seas are such that the ill-fated craft cannot be reached with a boat, the mortar cart is ordered out. The surfmen must either trudge with it over the flooded beaches, or else pick out a road back of the sand-hills, not unfrequently having to hew their way through brushwood and tangled thickets to the scene of the wreck.

Arrived on the spot the gear is quickly got in readiness for action, each man promptly performing the duty assigned him. The line is then fired to the vessel, and soon, if nothing hinders the operations, the breeches-buoy or life-car is travelling with its passengers to and fro between ship and shore.

At another time countless obstacles may have to be overcome. The ropes, as they are sent out, may snarl or tangle in the surf or current, or the roll of the vessel snap them asunder; the imperilled crew may bunglingly do their share of the work, or something else may unexpectedly happen to tax the resources at hand, and put the patience and courage of the surfmen to the severest test.

The annals of the Life-Saving Service are replete with splendid deeds of fearless daring. Each day's record adds to the roll of honor. When the life-savers went off through a violent sea to rescue the people of the German ship "Elizabeth," which stranded on the Virginia coast in January, 1887, all but two of the boat's crew perished, together with the entire ship's company, numbering twenty-two officers and men.

The Emperor of Germany ordered a generous gift of money to be equally divided among the families of the five surfmen who were drowned, and a gold watch, embellished with his likeness and monogram, to be presented to each of the survivors.

A notable rescue was recently achieved by the crew of the Ship-Canal Station, Lake Superior. Two vessels, a steamer and her consort, ran ashore six miles east of Marquette,

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